U. S. DEPARTMENT OF AGRICULTURE
Weather Bureau.

The Amateur's Aneroid Barometer.

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Aneroid barometers are widely distributed, but apparently not understood by many owners. The instrument is quite simple in itself, but confusion arises from auxilliary markings placed on the dials by manufacturers.

In order to understand the figures around the dial it is necessary to describe briefly the mercurial barometer, for it is the basis for these figures which are found on the dial without apparent beginning or end.

If a small glass tube a little more than 30 inches long, sealed at one end and left open at the other end, is filled with mercury and then inserted open end down into a cup containing mercury only a part of the mercury in the tube will flow into the cup, and there will remain in the tube a quantity of mercury of weight just sufficient to balance the pressure of the atmosphere at the place the experiment is conducted. Now if a yardstick be set up alongside it will be found that the upper end of the mercury in the glass tube is about 30 inches above the surface of the mercury in the cup, if your experiment was conducted at a low elevation such as Washington; but if you tried the same experiment at the top of a modern office building 500 feet high, the length would be only 29 1/2 inches because you are now above some of the atmosphere. And on the top of the Allegheny Mountains it would be only about 27 inches. If our barometer were kept at any one of these places continuously and readings made frequently it would be found that the length of the mercury column varies from day to day and even from morning to afternoon; but the total variation is usually less than one inch above or below the average, and hence we shall have actual need for only a few of the figures on our yardstick. Manufacturers therefore omit not only the useless figures, but the unneeded part of the yardstick as well.

In the aneroid barometer so frequently seen hanging on the walls of our homes there is no mercury nor liquid of any kind, but simply a little flat round metal box sealed air tight with solder and exhausted of air. One flat end of the box is then secured rigidly to the frame of the instrument. The box would now collapse on account of the pressure of the air unless restrained by some mechanical means; and so the manufacturer attaches to the other end of the box a spring strong

enough to hold the ends apart. It must be a strong spring, for it must hold back against a pull of 50 pounds or more depending upon the diameter of the little box. When the pressure changes the free end of the box moves slightly inward or outward as the case may be, and a train of levers magnifies this motion and communicates it to the hand or pointer that you see on the dial. The numbers that run around the dial are taken from our same old yardstick, and have been chosen by the manufacturer in the same way as those on the mercury barometer. In fact a measured mercury column is employed by the manufacturer to find out where to put the markings. These simple elementary facts will help you to understand how barometers operate; but the actual technique involved in their construction requires unusual skill and special equipment.

The pressure of the atmosphere, which is about 30 inches at sea level, decreases upon going to a higher elevation. The decrease is approximately one inch for each 1000 feet of elevation in the summer; but in the winter when the air is colder and consequently heavier, the decrease is about one and one-tenth inches for each 1000 feet.

People who have barometers do not all live at the same elevation and in order that they may compare results one with another, it is customary to add to the reading made at a high location a quantity that represents the weight of an assumed column of air extending downward to sea level. Now right here is the source of most of the confusion inexperienced persons have with their barometers. Some manufacturers attach special devices to the dials designed to accomplish this addition mechanically; and some owners set the reading far enough ahead to include the additional value in the reading. But since the amount to be added is greater at one time than at another, both these methods are unsound, and it is manifestly impracticable to escape the obligation to perform this simple problem in addition. Of course where precise results are desired the amount to be added must be determined with exactness by formulae found in text books on physics.

To learn whether your barometer is functioning, take it to a different elevation, such as a hill or a high building, and observe the action of the hand. It should vary about one-hundredth of an inch for each 10 feet of change in level. To learn whether it is approximately correct, make a reading about 8 a.m. add the reduction factor, 1 inch per thousand feet in summer, 1.1 inch per 1000 feet in winter, 1.05 inch fall and spring. Then watch the newspaper for the published value for your nearest Weather Bureau station. Agreement within 5 or 6 hundredths of an inch is about as good as you may expect.

Your barometer should be hung indoors. The pressure is the same in the ordinary room as outdoors.

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